CORRECTIVE ACTION PLAN

JANUARY 3, 2019

SOUTH, WEST, AND NORTH TREATMENT PLANTS
BLYTHEVILLE, ARKANSAS

ISSUED FOR REVIEW

PREPARED FOR:

Blytheville Wastewater Department
N Co Road 639
Blytheville, AR 72315

1/3/2019

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South, West, and North Treatment Plants
Blytheville Wastewater Department

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Introduction

This Corrective Action Plan was prepared by PMI on behalf of the Blytheville Wastewater Department (Blytheville). The Corrective Action Plan was prepared at the request of the Water Division Enforcement Branch of the Arkansas Department of Environmental Quality (ADEQ).

ADEQ has issued Consent Administrative Orders for each of the Blytheville Wastewater Treatment Facilities; the South Plant – AR0022578, West Plant – AR0022560, and North Plant – AR0022586. The Consent Orders are generally in place due to effluent violations at the treatment facilities such as Ammonia Nitrogen, Fecal Coliforms, and Mercury. The Corrective Action Plan presents a proposal to achieve compliance with all NPDES effluent limits.

History

The South Plant provides sewer service to an average of 5,200 customers and was constructed in 1988. The West Plant provides sewer service to an average of 6,000 customers and was also constructed in 1988. The North Plant provides sewer service to an average of 3,175 customers and three industrial customers. The facility was constructed in 1996.

All three treatment facilities are Biolac treatment plants and utilize activated sludge through extended aeration. The Biolac technology was commonly used in east Arkansas during the 1980s primarily because of the cost effectiveness of basin construction out of in situ soils. Stricter regulations implemented by ADEQ since the construction of the plants, together with the age of the plants, have led to the inability to treat the water to meet permit limits.

Conditions of Existing Facilities

South Plant

The South Plant has a permitted capacity of 1.4 million gallons per day (MGD). Flows over the past year indicate an average flow of 0.928 MGD and a peak flow of 3.677 MGD. The South Plant experiences difficulty treating Ammonia due to failure of the Biolac treatment equipment.

Equipment failure at the South Plant facility includes the majority of the aeration diffusers, racks, and sleeves. Drop lines that convey air to the diffusers have also failed due to corrosion of the steel clamps that connect the drop lines to the main headers. In a Biolac system, the aeration

headers are used to convey air to the diffusers and to provide mixing of the basin. After failure of the diffusers and drop lines, mixing velocity is impaired causing grit and sludge to settle in the Biolac basin. In addition, oxygen transfer decreases which affects the overall health of the microbiology in the basin.

Testing results reveal a very low MLSS at the South Plant with test results as low as 10 mg/l. MLSS for a Biolac treatment system should range in the 2500 mg/l to 3,000 mg/l. These values clearly indicate failure of the treatment system and need for replacement.

West Plant

The West Plant has a permitted capacity of 1.6 MGD. Flows over the past year indicate an average flow of 0.718 MGD and a peak flow of 6.353 MGD. The West Plant experiences difficulty treating Ammonia due to failure of the Biolac treatment equipment.

Equipment at the West Plant has failed in the same way as described at the South Plant and indicates need for replacement.

North Plant

The North Plant has a permitted capacity of 0.8 MGD. Flows over the past year indicate an average flow of 0.588 MGD and a peak flow of 2.028 MGD. The North Plant experiences difficulty treating Ammonia due to failure of the Biolac treatment equipment. Fecal Coliform violations have occurred at the North Plant as well as violations for Mercury.

Biolac equipment at the North Plant is in better overall condition than the other plants. Some of the aeration headers and sleeves have failed and are in need of replacement. Grit and sludge have also accumulated in the Biolac and polishing pond basins. At the present time, the UV Disinfection equipment is being replaced at the North Plant which should alleviate the Fecal Coliform violations.

Replacement of the aeration equipment and removal of grit and sludge in the basins should extend the life of the North Plant approximately 10 years.

Proposed Treatment System Upgrades

To enable the Blytheville Wastewater Department to consistently meet permit limits, PMI recommends combining the South and West Plants by constructing a sequencing batch reactor (SBR) treatment plant. At the North Plant, the existing Biolac facility should be rehabilitated to extend its useful life until a new plant can be constructed.

For this facilities plan, the new SBR treatment facility would be located at the existing South Plant site. The West Plant would be converted to a pump station.

Sequencing Batch Reactor Treatment Facility

Combining the South and West Plants into a new SBR treatment facility will provide many benefits to the Blytheville wastewater system. Nutrient removal, increased efficiency, elimination of an NPDES permit, and more consistent treatment are some of those benefits. PMI has evaluated siting the SBR at the South and West Plant sites and has determined that the South Plant site is more economically beneficial to the utility. A pump station will be constructed at the West Plant site along with a new forcemain to convey water to the SBR facility.

A primary benefit of the SBR is the capability of nutrient removal with minimal changes to the facility. Under the current NPDES permit ADEQ requires testing and reporting of nitrogen and phosphorus which are both considered nutrients. Although a permit limit for those nutrients is not currently in place, future permit conditions may include them. An SBR facility will not only provide more consistent treatment to meet current permit limits, it also prepares Blytheville for potential nutrient limits.

Significant cost reduction to the project can be achieved by utilizing the existing Biolac basins as equalization basins. The Biolac basins will be drained, cleaned, and put back into service as storage basins during high flow events. By storing the water during high flow events, pumping and treatment equipment size is reduced. Furthermore, utilizing the existing basins will itself provide a significant savings in capital cost compared to construction of new equalization basins. The following is a calculation of available storage capacity in the existing Biolac basins:

South Plant Equalization Basin Calculations

Basin	Length	Width	Depth	Volume	
1	238	193	10	3435863	
2	162	193	10	2338697	
			Total Volume =	**5774560**	**MG**

West Plant Equalization Basin Calculations

Basin	Length	Width	Depth	Volume	
1	215	195	10	3135990	
2	174	187	10	2433842	
			Total Volume =	**5569832**	**MG**

Constructing a pump station at the West Plant and forcemain to the South Plant will provide the means to consolidate the two plants. Peak flows at the West Plant reach 6.35 MGD, however by utilizing the existing Biolac basin for equalization the pumping rate can be design at half of the peak. Screening at the West Plant should be kept in service while the remainder of the plant

equipment is abandoned. A new pump station with 2-60 hp pumps rated for 2500 gpm would pump wastewater through a 16" forcemain to the South Plant during high flow events. Two average flow pumps would also be included to handle dry weather flows. The forcemain should be adequately sized to potentially handle the flow from the North Plant in the event all the plants are consolidated at the new SBR.

Potential Energy and Operation Cost Savings

Consolidation of the South and West Plants will allow for increased efficiency through reduction in energy cost, labor, operation, and laboratory testing. A significant reduction in energy cost will be achieved by utilizing variable frequency drives on the blowers and dissolved oxygen controls. Blowers will have the capability to speed up when flow and loading increases and slow down when loading decreases. Below is a calculation of the electrical cost of the proposed SBR facility and West Pump Station.

Proposed Facilities Electrical Calculations Based on Mississippi County Coop Industrial Rate

Sequencing Batch Reactor and South Plant Equalization Basin

Item	HP	Max KW	$/KW	kWh/Month	$/kWh	Monthly Cost
SBR Blowers	68.3	50.9	$553.62	36690	$0.03044	$1,116.84
SBR Jet Pumps	37.6	28.0	$304.78	20220	$0.03044	$615.50
EQ Basin Pumps	40	29.8	$324.23	4782	$0.03044	$145.56
Miscellaneous		25.0	$271.75	10000	$0.03044	$304.40
	145.9	133.8	$1,454.38	71692		$2,182.30
				Total Electrical Cost =		**$3,636.68**

West Plant Equalization Basin

Item	HP	Max KW	$/KW	kWh/Month	$/kWh	Monthly Cost
EQ Basin Pumps	100.4	74.9	$813.82	5825	$0.03044	$177.31
EQ Basin Aeration	10	7.5	$81.06	1500	$0.03044	$45.66
	110.4	82.3	$894.88	7325		$222.97
				Total Electrical Cost =		**$1,117.85**

The Biolac plants are capable of two modes of operation, on and off which essentially requires the blowers to be on at all times. Electrical cost at the South and West Plants averages $9,000 per month and laboratory testing is approximately $1,650 per month. Excluding labor, total cost to operate the South and West Plants in their current condition is $10,650.

By eliminating an NPDES permit and constructing the new facilities, Blytheville will realize savings through decreased electrical cost, laboratory testing and labor. Estimated electrical cost for the consolidated SBR and West Pump Station total $4,754.54 and laboratory testing will average $825. Total savings could reach $5,070.46 per month or $60,845.52 per year after consolidating the South and West Plants into an SBR facility.

Operation and Peak Flows

The SBR facility will require more day-to-day operation than the Biolac facilities. Operational testing of the biomass will primarily remain the same; however, adjustments to cycle time of the SBR will require monitoring and adjustment. This will primarily occur during seasonal changes. Controls at the plant will be able to be remotely viewed by the plant manufacturer to assist the operator with adjustments to ensure compliance with permit limits.

SBRs are designed to treat the wastewater in batches by alternating treatment cycles in each cell. The treatment is achieved using 5 primary steps. The first step is anoxic fill which is followed by an aerated step where the blowers are operated at full speed but the DO remains near zero. This step encourages the growth of well settling, facultative bacteria. Next is the react step where the cell is full and aeration and mixing are utilized until complete biodegradation of organic material has occurred. Following react, the third step is settle which is when the blowers are turned off and the biomass is allowed to settle. The fourth step is decant which is the discharge of treated effluent from the cell. The final step is the idle period. During idle, waste sludge is removed to maintain the correct biomass in the reactor.

Controls for the SBR center around a level controller and DO probe. The level controller automatically adjusts the treatment steps and cycle times to allow for high flow events. Peak flows cause issues at activated sludge treatment facilities such as Biolac or similar style systems. The peak flow events can cause washout of the biomass (activated sludge) which leads to violations and non-compliance of permit limits. After a washout, reestablishment of biomass can take upwards of a month. An SBR can be hydraulically sized to allow for a peak flow event to pass through without causing a washout of biomass.

Headworks and Disinfection

Prior to the SBR, headworks is required to consist of fine screening at a minimum. For this project a spiral screen is recommended for fine screening and a grit removal system should be evaluated as part of the headworks. If grit removal is not included due to cost considerations, cleaning of the SBR basins will be required every 2-3 years. Disinfection to meet Fecal Coliform limits is required and will be accomplished by utilizing ultraviolet disinfection as is currently used at the other Blytheville facilities.

Summary of Recommendations

As described in this facilities plan, PMI recommends to consolidate the South and West Plants into a new SBR facility. The West Plant will be converted to a pump station and both facilities will utilize the existing Biolac basins for flow equalization. Included with this report are detailed calculations of SBR sizing, pump selection, and headworks equipment in addition to proposed layouts of the improvements.

Milestone Schedule

The milestone schedule for implementation of the Corrective Action Plan is provided below:

Day	Milestone
0	Initiate CAP upon approval by ADEQ
180	Complete Engineering Plans and Specifications for ADEQ Permit Submittal
180	Submit NPDES Modification and Construction Permit Application to ADEQ
180	Obtain Project Funding
360	Receive NPDES Permit from ADEQ
360	Procure Contractor and Begin Construction
900	Complete Construction of Facilities
930	Achieve compliance with permit limits

Interim Operating Plan

During the time period outlined in the milestone schedule, each treatment facility will be operated and maintained to best meet permit limits. The City began implemented the following steps and practices to meet those goals in summer of 2018:

- Upgraded the UV Disinfection system at the North Plant
- Replaced blowers and installed emergency generators at all facilities
- Daily monitoring of MLSS and other conditions at each facility
- Daily monitoring of all treatment system components to ensure proper function
- Increased MLSS at South and West Plants
- Utilizing polishing basins for settlement
- Hired consultant to perform weekly checks of biology at each plant
- Consultant providing training to wastewater department employees

By taking the outlined steps each plant has seen improvement since July 2018. The City will take every step possible to achieve compliance with permit limits during the interim operating period.

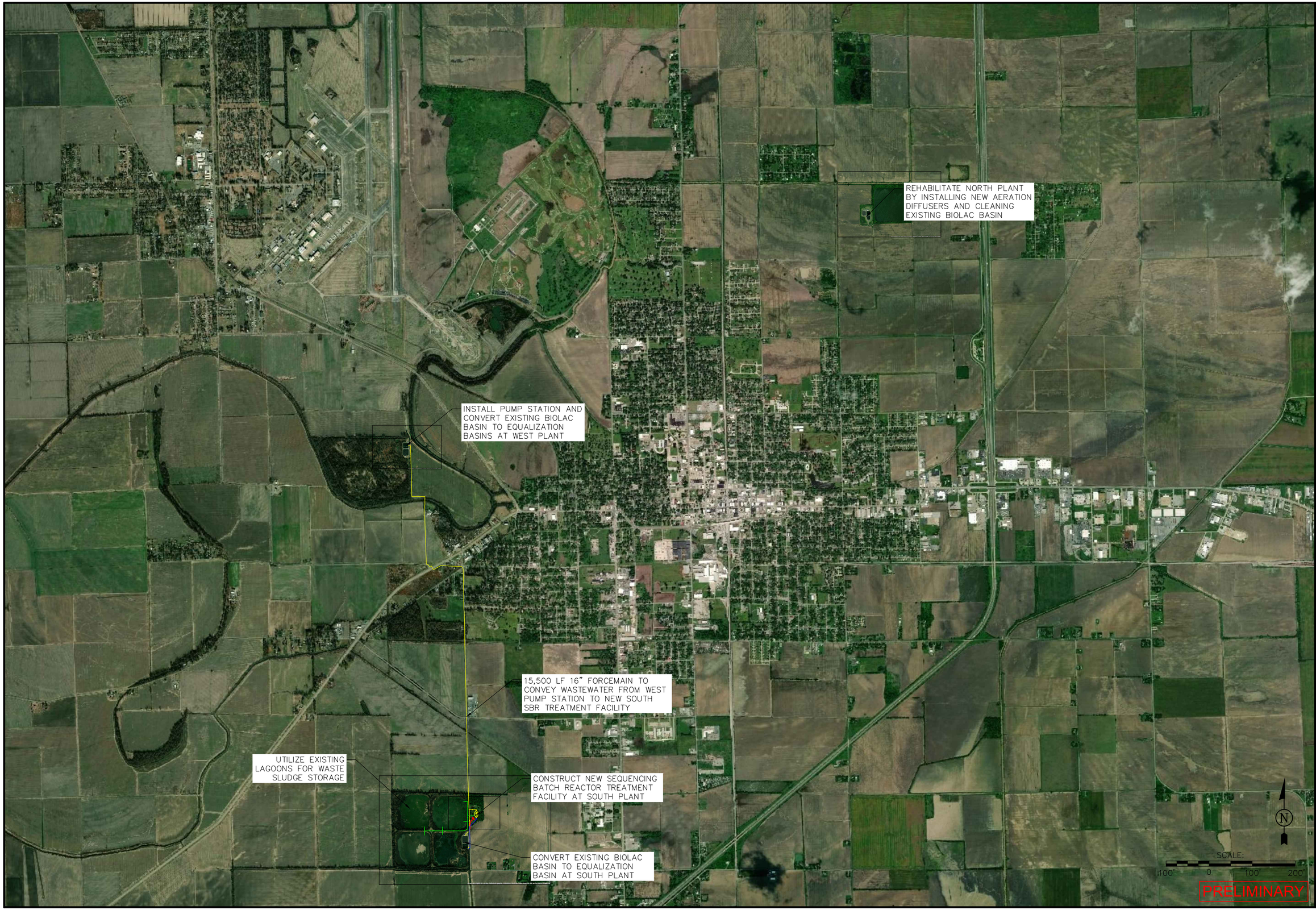
Sanitary Sewer Evaluation Study

The City has been working towards rehabilitating sanitary sewer gravity lines, manholes and lift stations as funds allow. Rehabilitation has been done in areas identified in previous sanitary sewer evaluation studies and many SSOs have been eliminated.

Moving forward, as part of the overall treatment system project upwards of $1,000,000 will be dedicated to sanitary sewer rehabilitation. During project design, areas of the City will be categorized and estimated costs assigned to rehabilitate sections of the sewer system. High priority areas will be designated with the overall outlook of stretching the available funds to reduce I&I to the greatest extent possible.

In additional to the collection system project, the existing Biolac basins at the South and West Plants will be converted to equalization basins. This will enable the new SBR to receive a more consistent flow and coupled with reduced I&I work to achieve consistent compliance with effluent limits.

FIGURES



NOT FOR CONSTRUCTION

SHEET TITLE: PROJECT OVERVEIW

PROJECT TITLE: BLYTHEVILLE WASTEWATER SYSTEM IMPROVEMENTS
PROPOSED SOUTH PLANT SBR

REVISIONS:

NO:	DATE:	DESCRIPTION:	BY:

CIVIL ENGINEERING AND ENVIRONMENTAL SERVICES
3512 SOUTH SHACKLEFORD RD
LITTLE ROCK, ARKANSAS 72205
PH: (501) 221-7122 FX: (501) 221-7775

DESIGNED BY:	BJW	DATE: SEPT 25, 2018
DRAWN BY:	BJW	SCALE: 1" = 30'
CHECKED BY:	BJW	

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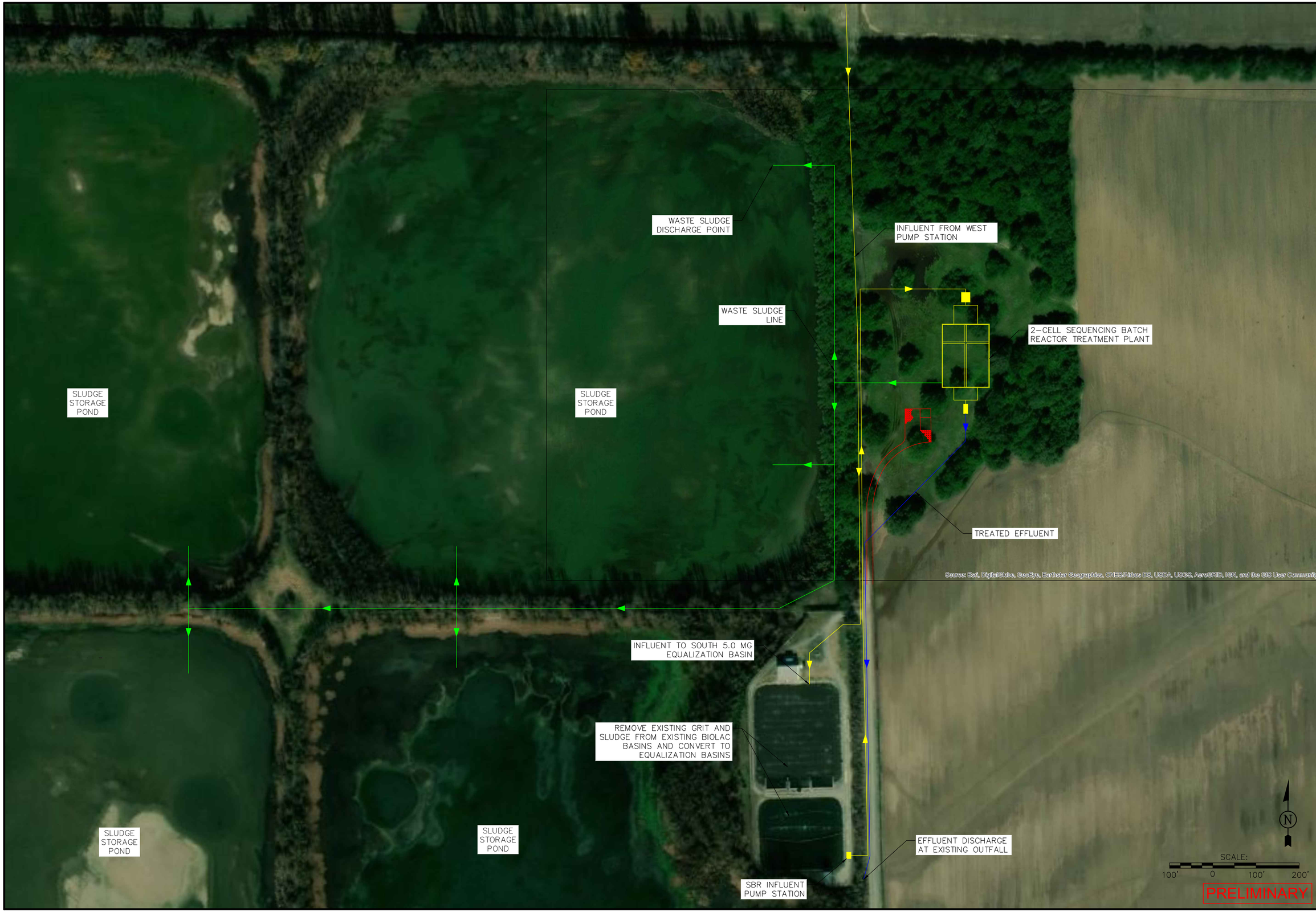
JOB NUMBER: BLYW-11202

SHEET NUMBER: 1

PRELIMINARY



NOT FOR CONSTRUCTION

SHEET TITLE: SBR SITE OVERVEIW

PROJECT TITLE: BLYTHEVILLE WASTEWATER SYSTEM IMPROVEMENTS
PROPOSED SOUTH PLANT SBR

REVISIONS:

NO.	DATE:	DESCRIPTION:	BY:

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JOB NUMBER: BLYW-11202

SHEET NUMBER: 2

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SHEET TITLE: SBR SITE LAYOUT

PROJECT TITLE: BLYTHEVILLE WASTEWATER SYSTEM IMPROVEMENTS
PROPOSED SOUTH PLANT SBR

REVISIONS: NO.	DATE:	DESCRIPTION:	BY:

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DESIGNED BY:	BJW	DATE: SEPT 25, 2018
DRAWN BY:	BJW	SCALE: 1" = 30'
CHECKED BY:	BJW	

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JOB NUMBER: BLYW-11202

SHEET NUMBER: 3

PRELIMINARY

NOT FOR CONSTRUCTION

SHEET TITLE: WEST PUMP STATION SITE OVERVEIW

PROJECT TITLE: BLYTHEVILLE WASTEWATER SYSTEM IMPROVEMENTS
PROPOSED SOUTH PLANT SBR

REVISIONS:

NO:	DATE:	DESCRIPTION:	BY:

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PH: (501) 221-7122 FX: (501) 221-7775

DESIGNED BY:	BJW	DATE: SEPT 25, 2018
DRAWN BY:	BJW	SCALE: 1" = 30'
CHECKED BY:	BJW	

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JOB NUMBER: BLYW-11202

SHEET NUMBER: 4

NOT FOR CONSTRUCTION

SHEET TITLE: NORTH PLANT SITE OVERVEIW

PROJECT TITLE:
BLYTHEVILLE WASTEWATER SYSTEM IMPROVEMENTS
PROPOSED SOUTH PLANT SBR

REVISIONS:

NO.	DATE:	DESCRIPTION:	BY:

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DESIGNED BY:	BJW	DATE:	SEPT 25, 2018
DRAWN BY:	BJW	SCALE:	1" = 30'
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JOB NUMBER:
BLYW-11202

SHEET NUMBER:
5

PRELIMINARY